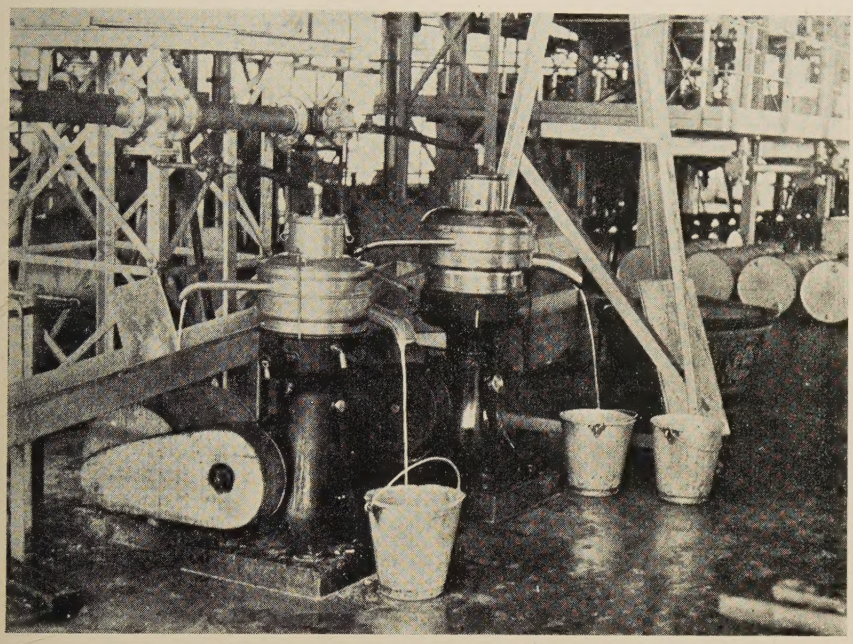
PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA



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September
1954

R R I

LOCATION. The Institute's Laboratories and Offices are at the third mile, Ampang Road, Kuala Lumpur.

CORRESPONDENCE. All LETTERS must be addressed to the Director, Rubber Research Institute of Malaya, Post Office Box 150, Kuala Lumpur. Special inquiries may be marked for the attention of a particular officer, if so desired (See Staff List in Bulletin No. 1, page 24). The address for TELEGRAMS is Searching, Kuala Lumpur. TELEPHONE: Kuala Lumpur 3351/2/3. PARCELS occasionally arrive without any indication of their origin. It is requested that senders will write their names and addresses clearly on the outside of all packages, and also advise the Institute by letter or telegram of their despatch. This is especially important for perishables, such as latex samples and plant specimens.

PROHIBITED PLANT SPECIMENS. Attention of planters and others in territories outside the Federation of Malaya and the Colony of Singapore is drawn to the Malayan Plant Importation Rules which prohibit the importation into Malaya of any part of a plant, whether living or dead, unless it is accompanied by a permit issued by the Director of Agriculture, Federation of Malaya. No permit will be issued in respect of any diseased plant or any plant pest. Any plant imported in contravention of these Rules (whose object is to prevent the introduction of diseases or pests) will be destroyed without examination. Anyone outside Malaya who desires our advice on pests or diseases or any other matters that may require examination of living material must first submit an inquiry by letter giving the fullest possible description of their problem.

ADVICE. Inquiries are invited from rubber producers in the Federation of Malaya, the Colonies of Singapore and North Borneo, and the territories of Sarawak, Brunei and Nigeria, who may require more detailed information applicable to their own special problems. INTERVIEWS should be arranged by letter or telephone, as members of the senior research and advisory staff are frequently absent on visits to plantations. The Institute is open from 8 AM to 1 PM and 2 PM to 4 PM on Mondays to Fridays, and from 8 AM to 12.30 PM on Saturdays.

EXPERIMENT STATION AND FACTORY. This station of the R R I is situated 16 miles from Kuala Lumpur, at Sungei Buloh on the Kuala Lumpur — Kepong — Kuala Selangor road. Visits may be made on Mondays or Wednesdays by arrangement with the Director of the Rubber Research Institute (see CORRESPONDENCE above). There is a guest house.

PUBLICATIONS. A list of 'Publications of the R.R.I.' is available on request. Subscription to Planters' Bulletin may be made by depositing $10 with us.

PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

Kuala Lumpur September 1954 Number 14

Editorial: Rubber from West to East

A considerable fame has attached to the name of Sir Henry Wickham, enhanced of late by a number of articles appearing in the agricultural and technical press. Unfortunately some writers have not taken sufficient care in checking their facts, with the result that popular misconceptions — such as the unfounded charge of smuggling — are perpetrated.

Accordingly we are devoting this *Editorial* to a resumé of the establishment of hevea rubber in the east, and in particular we would draw attention to the part played by those government men who were so farsighted as to see the unique opportunity of growing rubber in British territories — the civil servants who are apt to receive little public acclamation.

It was in 1834, even before the invention of vulcanisation, that the increasing use of rubber and its high price led the English rubber manufacturer Thomas Hancock to suggest the possibility of growing hevea in the east, where the climate appeared suitable. This plea seems to have raised no response though rubber consumption continued to increase and all accessible resources were rapidly being overexploited.

In India, rubber was obtained from *Ficus elastica* with wholesale destruction of the jungle trees of that species. This was for a long time considered to be the commercial rubber plant in India and the east; it fell to Sir Clements Robert Markham, in charge of the geographical section of the India Office, to put forward proposals for the establishment of *Ficus elastica* plantations and the import of other plants producing rubber. Markham had earlier experience of plant introduction for it was he who had brought cinchona to India in 1860, and being in a position to do something about the development of a rubber industry he commissioned Mr James Collins to collect together all available information on plants bearing rubber so that an appraisal of the possibilities could be made. Collins was at one time curator of the museum of the Pharmaceutical Society and had made a study of the rubber industry.

Collections of most of the heveas had been made by the English botanist Richard Spruce, and the herbarium of the Royal Botanic Gardens at Kew already contained much material of the various species. In 1854 both lots of material were described by George Bentham in *Hooker's Journal of Botany* and it was this publication, together with a note by Sir Dietrich Brandis, which formed the basis of Collin's report which was published in 1872. The note by Brandis was to the effect that hevea should be imported and planted in Ceylon, Malabar and Burma.

On the strength of Collin's report the India Office attempted to obtain hevea seed through the British consul at Para, but the main driving force leading to a first consignment of rubber seeds to Kew was Sir Joseph Hooker, then Director of the Royal Botanic Gardens. These came from Cametá and were sent for Collins by a Mr Farris – to whom, if to anyone, is credit due for the first successful export of hevea seed from Brazil. For out of these seed a dozen plants were raised at Kew in 1873, of which six were taken to India by Dr King, then Superintendent of the Royal Botanic Gardens, Calcutta. These plants grew; they were propagated and distributed to Sikkim. Thus was hevea first established in the east, although in 1876 Dr King had to report failure at Calcutta and in Sikkim, due to climate.

A second consignment of seed was exported from Brazil in 1875 and was sent ungerminated to India, but no plant was raised.

From this point efforts to obtain more seed seem to have proceeded independently, by Sir Joseph Hooker and by Sir Clements Markham. The former obtained the service of Mr H.A. Wickham (later Sir Henry) who had collected plant specimens in the Amazon area for the herbarium at Kew. Markham commissioned Mr Robert Cross, who had assisted previously with the introduction of cinchona to India, but Cross was diverted from giving immediate attention to the task, as he had first to go to Panama to collect material of *Castilla*, another plant bearing rubber.

Thus Wickham's famous collections of seed reached Kew on 14 June 1876, three years after the consignment of Farris (2 June 1873), but before the material collected by Cross (22 November 1876).

As to the suggestion that Wickham's export of seed from Brazil was illegal, Dr Th. G.E. Hoedt has written from Indonesia to draw our attention to a recently discovered official document published in 1913 at Rio de Janeiro, and entitled *Borracha no Brasil*. This contains a report on several exports of hevea seed from Brazil by Collins, by Wickham, and by Cross, and states that Wickham's historic shipment to Kew was due to the goodwill and cooperation of the Brazilian government.

On germination at Kew, Wickham's collection of 70,000 seed yielded 2,800 plants, a large number of which were sent to Ceylon, and smaller lots to Malaya, Java and elsewhere. It is common knowledge that the east has been stocked with the progeny of these plants for none of the seedlings collected by Cross is known to have reached the east, and subsequent introductions have had little effect on the supply of seed available once the original seedlings had started to bear.

It is perhaps fortunate for the rubber industry that it was the seedlings from Wickham's collection which succeeded, and not those from the collections of either Farris or Collins. Wickham obtained his seed near a place called Boim on the high land between the Tapajos and Madeira rivers in the central valley of the Amazon. It is now known that the higher up the valley the better is the quality of the jungle trees of *H. brasiliensis*. In the low lying parts of the Amazon estuary, *H. brasiliensis* is considerably degraded by interspecific crossing, particularly with *H. spruceana*. Farris collected at Cametá, near Belem, and at the Ilha de Marajo — whence the film gets its name. If his seedlings had been established in Ceylon instead of in India, they would probably

have thrived and the plantations of the east might have been stocked with inferior material. Collins also collected in the Amazon estuary, at Para.

While Wickham has our admiration and respect for his initiative and great energy in collecting and consigning such a large quantity of seed, much credit for the introduction of hevea to the east must go to Sir Clements Markham and to Sir Joseph Hooker, and for its exploitation to Mr H.N. Ridley who, as Director of the Botanic Gardens at Singapore from 1888 to 1912, showed the way to the pioneer planters.

Correspondence

The Editor of PLANTERS' BULLETIN *invites letters of general interest for publication in this column. Comment and queries arising from articles recently published will be welcome.*

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OPENING UP YOUNG REPLANTS

We have become increasingly aware that many informed persons in planting circles have doubts as to the efficacy of bringing into tapping – for example – budded stumps five years from the date of planting.

We have heard the opinion expressed that much would be gained by better tree development if tapping were postponed for a period of about six months. For example, if the customary minimum girthing were achieved by May then the area would be tapped during the ensuing October/November, and rested during the following wintering period.

It would be interesting to have your views as to whether you consider there is any advantage in deferring the commencement of tapping for six months after the minimum girth has been reached.

Harper, Gilfillan & Co Ltd
D.R. Denning
Estates & Mines Dept

Our criterion for commencing tapping is a girth of 20 inches at the height of opening. We believe this was first suggested by the late Dr P.J.S. Cramer in Java. Long experience has proved it practicable and superior to using age as a criterion.

We advise postponing tapping for a few months until after wintering, if necessary. An area is normally brought into tapping when 70% (or not less than 100 trees/acre) of the trees have reached the standard girth.

Tapping reduces girthing to about an inch a year, and sometimes tapping is delayed until girths are 22 – 24 inches.

We know of an experiment on eight clones, comparing tapping at 6 years (girth 19½ inches) with tapping at 8 years (girth 26 inches). The latter trees yielded about the same in their first year of tapping as did the former in their second year. Thus there appears to be no advantage in delaying tapping, once the girth of 20 inches is reached.

To test the suggestion made in the above letter comparative yields would be needed over the whole economic life of a planting, say 30 years or more. It may be that early loss of yield due to late tapping is compensated by later performance, under certain circumstances.—Editor

Latex Concentrate

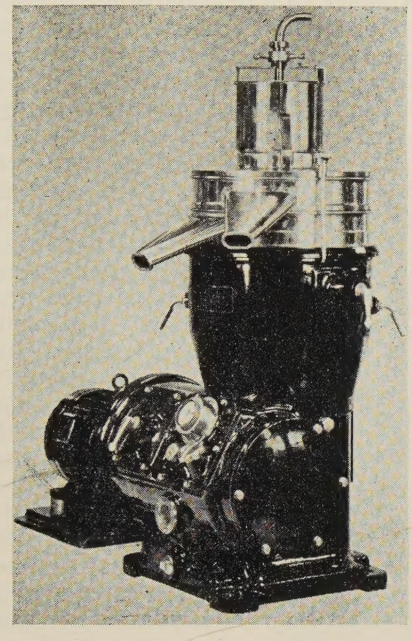
We have pleasure in presenting a guest article by the General Manager of H & C Latex Limited. Mr J.H. Pidford, the author of our manual 'Latex Preservation, Concentration and Shipment', discusses the recent trend in commerce and its technical implications for estates. The views expressed are, of course, those of the author and not necessarily those of the R.R.I.

ANNUAL EXPORTS OF PRESERVED LATEX from Malaya have increased from forty thousand tons dry in 1948 to seventy two thousand tons in 1953 in spite of the temporary setback caused by the abnormally high rubber price and the restriction for a period on American consumption. Practically the whole of this growth has been in centrifuged latex. The export of normal latex (of 38 to 40 d.r.c.) has almost ceased, since few estates can produce this type direct from the trees and boosting with concentrate is necessary. The packing and freight charges are also fifty per cent higher, per pound of dry rubber, than for concentrate. Creamed latex continues to be made by the company which pioneered it, but various other producers who tried it have reverted to centrifuging. To make really first quality cream is probably no cheaper and is technically more difficult than to prepare centrifuged latex, which is much more widely accepted by the consumer. The manufacture of evaporated latex (Revertex) continues steadily as a special product but does not compete in the ordinary latex market. The patentees of the electrodecantation process have continued to develop it and it is believed that production has reached a fairly large commercial scale, but no information has been published nor is the product generally available on the market, as it is used in the producers' own factories. Thus the latex trade today deals almost entirely in centrifuged concentrate.

The other noticeable trend has been the development of large central factories, which has gone hand in hand with the growth of bulk shipment. Latex can now be received in bulk at numerous depots between Boston and Baltimore on the Atlantic seaboard, and on the Pacific coast of the U.S.A. as well as at Liverpool, Hull, Rotterdam, le Havre, Genoa and Hamburg. Other bulk receiving depots are under consideration in Europe, Japan and Australia. From such depots latex is distributed to users in rail tanks, road tanks or returnable drums, thereby saving the rather costly non-returnable drum packing. The cost of port loading facilities and the large volume necessary preclude from this business the small factory catering for the crop of a single estate, although that difficulty can be overcome by grouping a number of such producers to feed one installation. This is not to say that highly successful small, 'single estate', plants cannot be operated. A number are – and there is little doubt that the demand for considerable quantities of latex in drums will persist for many years.

The large scale processor is faced with most serious problems, which confront the small factory only to a minor degree. All subsequent experience confirms the early R.R.I. advice that proper supervision in the field and prompt preservation are the first essentials in the preparation of good latex. With care fresh milk can be kept sweet but bad milk cannot be made fresh. Latex is similar. The large processor cannot exercise direct supervision over the field work or preservation at the

field collecting point and has to rely on the goodwill of the supplying estate. Often he is merely a buyer and cannot pick and choose. There are quality penalties in most buying agreements, but one cannot lightly reject the crop of a supplier who has no sheet or crepe machinery working. Owing to the greater area served the time lag before delivery of raw latex to the process factory is also longer, which renders preservation of greatest importance. Although much work has been done on this problem no revolutionary solution has been found. The only available solution is the proper disciplining of tappers, and the addition of preservative to the tapping cups. The test for volatile fatty acids has proved useful in detecting poor preservation. Wanton dilution of latex with water and deliberate adulteration of latex are also a serious problem. These practices originate from payment by results and the almost universal use of the hydrometer (Metrolac or Simplexometer) for determining individual tapper's yields. A quick accurate method suitable for estate use in determining true d.r.c. for each tapper is badly needed.



The latest De Laval latex centrifuge, type 310.70A, now available in Malaya.

Attempts to improve the output and efficiency of centrifugal machines have continued, but it appears that designers are approaching the limit of performance as gains in one direction are offset by disadvantages in others. There are several conflicting factors:

a Efficiency, *i.e.* the proportion of input rubber recovered as saleable concentrate.

b Throughput per hour. Efficiency usually falls as this increases.

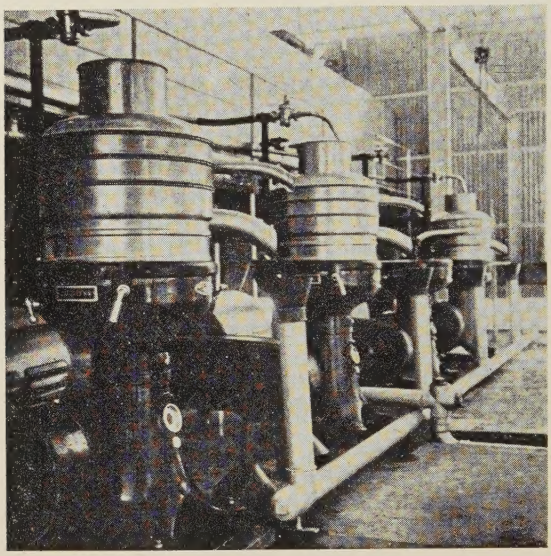
c Running time and tendency to clog. Efficiency usually falls as the run proceeds. Bowl cleaning costs both running time and rubber losses in washing.

d Stopping, starting and cleaning time.

It is standard practice in large factories to work a battery of machines with a number of spare bowls, and to secure the optimum economy all of the foregoing factors have to be considered together.

Probably the most widely used machine at present is the De Laval L. 197 type which was first developed before the war and has been continuously improved since. The same manufacturer has also introduced a larger machine the LRH 210 series. This has a higher throughput and longer running time but is appreciably more costly; it has a recovery efficiency comparable with the smaller machine. Both have

been extensively used in commercial production and have established a high reputation for mechanical reliability. Skilled service and bowl balancing facilities are available in Malaya. The Westfalia A.G., one of whose machines was tested at the R.R.I. before the war — this machine incidentally is still working at Sungei Buloh — have recently introduced a new machine of larger capacity. Preliminary tests have shewn it to be promising and it appears to offer close competition to the De Laval machines. It remains to be seen how it will stand up to prolonged commercial use, but as far as can be judged from careful examination and test runs, it seems a carefully designed and sound machine.



A battery of Westfalia latex centrifuges of large capacity, type MLK 8001 in an estate factory.

Skim recovery continues to be the main problem facing the latex processor. Apart from a recent patent covering enzyme treatment of the skim, little has been published on the subject. It is known that some form of skim rubber recovery is practised by all large latex process factories. As usually produced skim rubber is not satisfactory for compounding and vulcanising in the same way as ordinary rubber; it is banned by the Rubber Manufacturers Association of New York from inclusion in any of their recognised types. The Rubber Research Institute has recently been investigating this problem and it is hoped that improved production methods of dealing with skim latex will soon be available. There is no reason why this improved skim rubber should be sold at a large discount. All skim rubber has one supreme advantage over most other rubber in that it is clean — the centrifuge removes the sand and dirt. There appears to be scope here for coordination between producer and consumer research. One of the past troubles has been that the quantities available were not sufficient to interest any really large consumer or to constitute a recognised separate grade. The expansion of latex production is altering this picture and there must now be something of the order of 500 tons of skim rubber per month available in Malaya, from all sources. The question of skim recovery has a major bearing on the economics of latex manufacture.

As raw field latex has to be bought at or near RSS price, and as skim recovery is expensive and the product sold at a varying discount, the prime objective is usually high efficiency of recovery as concentrate.

This means low throughput per machine and a correspondingly higher capital outlay and labour cost for a given volume of production.

There are many other secondary factors influencing results but the foregoing cost consideration of efficiency has, as far as the writer is aware, induced all major producers to operate at relatively low throughput and high efficiency. The policy is also favoured by the difficulty of obtaining ever increasing supplies of raw latex to meet the demand for concentrate within economic collecting radius. Every producer naturally wishes to get the maximum amount of saleable concentrate from available rubber supplies. As a result of this policy, most producers have reserve capacity which is capable of dealing with seasonal fluctuations and flush crops at some small cost in efficiency.

In conclusion I feel there are a few points in connection with latex production worthy of consideration by all rubber producers. Since articles manufactured from latex do not pass through the step of mastication and reinforcement which in the dry rubber field brings the quality of synthetics up to that of natural, it is in the latex field that natural rubber growers still have a great technical lead over our synthetic rivals. This outlet for natural rubber appears to be one meriting major research effort to widen latex applications and to improve our knowledge of the material. Secondly, since foam – the major product – is a 'comfort' if not a luxury article, a large part of the latex market is sensitive to price movements and an excessive rubber price not only adversely affects the competitive position of natural against synthetic in the dry rubber field but also cuts severely into latex use. The final point is that were it not for latex, a correspondingly increased amount of sheet would be produced, mostly in estate grades, which would further depress the market. Thus latex, by increased use and the removal of increasing quantities of dry rubber from the market as the price falls, acts as a small but by no means negligible insurance against slumps in natural rubber. It therefore deserves the interest and goodwill of all growers whether or not they are themselves directly concerned with latex processing.

J.H. PIDFORD

Pot Culture

Dr E.W. Bolle-Jones continues a description of his studies on the nutrition of *Hevea brasiliensis* in Communication 290 of the *Journal of the R.R.I. of Malaya.* He has fed Tjir 1 seedlings on diets deficient in nitrogen, sulphur, phosphorus, magnesium, potassium, calcium, iron, manganese, and boron. Each such treatment limited or retarded growth. Effects on the contents of rubber, chlorophyll, and minerals in the plant were also observed and are discussed in this second paper.

It is important to recognise symptoms of nutrient deficiency, in order to assess efficiency of crop production, and as a guide to advisory work. The identification of these symptoms and the effect upon growth and chemical composition of the plant provide a basis for manurial and cultural practices.

Special aspects of this work have also been communicated to the scientific journals *Nature* and *Physiologia Plantarum,* and to the Fifth International Congress of Soil Science, in the Belgian Congo in August.

Establishing a Legume Cover

IT IS ACCEPTED THAT TREE CROPS OF ECONOMIC IMPORTANCE in the tropics should be grown in association with some other smaller plant species which will form a protective cover for the soil. Furthermore, it is generally agreed that creeping legumes form the best and most suitable ground cover in rubber areas but these have one disadvantage and this is important. There are few areas where the leguminous creepers can be maintained as an effective cover when the rubber trees have reached maturity. For this reason there is some doubt whether the expense of establishing legumes is always justified.

In the few areas where it is known that creeping legumes will continue to grow vigorously in association with mature rubber trees, there is no problem. Here, the early establishment of a leguminous creeper at the time of planting or replanting is undoubtedly a sound policy. But regarding the great majority of replanted areas it is not possible to state with the same degree of confidence that the expenditure on establishing a leguminous cover would always be fully justified.

We take the view* that it would be preferable to concentrate on establishing a good type of indigenous cover from the outset in those areas where there is a reasonable chance of obtaining a fairly good distribution of these more permanent plant species within a reasonably short time. But conditions in areas being prepared for replanting vary considerably. The presence or absence of acceptable indigenous plants for growing in association with the rubber trees is determined by the kind of vegetation the area carried previously and the method used for preparing the ground for replanting. It is probably true that a high proportion of the areas to be considered will have grasses or some other undesirable weed as the dominant ground cover at the outset. In such cases we consider that the best and probably the cheapest procedure in the long run would be to eradicate these grasses completely, either by spraying with weedkillers or by cultivation with mechanised equipment, and then to cover the ground as quickly as possible by a quick growing leguminous creeper. Successful establishment of such a cover constitutes the best defence against colonisation again by grasses and other undesirable weeds.

In some areas being prepared for replanting the ground is almost bare or the growth of upright indigenous plants is sparse merely because very little has grown for some years under the shade of the old rubber trees. Here again we would prefer to establish a cover of leguminous creepers rather than wait for desirable indigenous plant species to become established by chance.

To sum up, we would advise the early establishment of a quick growing leguminous creeper in all replanted areas where the development of an effective cover of acceptable indigenous growths is likely to take some considerable time. Exposure of the soil should be avoided if possible at all times, but the need for a protective cover is most urgent during the early stages of growth of the rubber plants. Leguminous creepers are undoubtedly the most suitable plants for covering a bare soil in a short time.

* *See 'Covers and Weeding' in Planters' Bulletin 13, page 64.*

SEED MIXTURES

The creepers most usually sown are *Centrosema pubescens, Pueraria phaseoloides,** and *Calopogonium mucunoides. Centrosema* makes rather slow growth in the early stages, but eventually forms an excellent cover and is the most permanent of the three. Where a legume creeper continues to grow in mature rubber areas it is usually *Centrosema* that persists. For this reason we would recommend that seeds of *Centrosema pubescens* should always be included in the mixture to be sown in young rubber areas.

A new clearing 10 months after sowing the legume mixture, Calopogonium, Centrosema and Pueraria. The Pueraria is most evident at this stage. A few flowering heads of the grass Paspalum conjugatum are visible, but the legumes form the dense soil covering mat.†

Pueraria phaseoloides is the most vigorous grower and when well established it forms a dense thick cover. It assumes dominance over the other legumes during the early years when there is no overhead shade, and throughout this period it has the greatest suppressing effect on other undesirable plant species. This is one of its most important advantages for it helps to keep down weeding costs.

Calopogonium mucunoides generally makes the most rapid initial growth. It has been claimed that it forms a complete cover over the ground within four months from sowing. But it is less hardy than the other creeping legumes and it usually dies down earlier. For this reason it is considered to be of comparatively less value than the other two leguminous creepers. Nevertheless it has a certain merit when there is need for covering the ground quickly.

Suitable creeping cover seed mixtures are:

(*a*) 5 parts *Calopogonium*
4 parts *Centrosema*
1 part *Pueraria*

(*b*) 4 parts *Centrosema*
1 part *Pueraria*

(*c*) 1 part *Centrosema*
1 part *Calopogonium*

Our first choice would be mixture (*a*). The advantages of sowing a mixture of the three creepers become apparent when their growth habits as indicated above are considered. The chief essentials of an effective

* *This species is also known, commonly but less correctly, as Pueraria javanica.*

† *Photograph, Dr P.R. Wycherley.*

ground cover are, rapid growth to cover the ground quickly (*Calopogonium*); dense and vigorous growth to suppress weeds and to prevent colonisation by grasses (*Pueraria*); and continued growth for as long as possible during the period when overhead shade increases (*Centrosema*). There is a better chance of achieving these objectives when a mixture of the three cover crop seeds is sown.

Mixture (*b*) would be a second choice while mixture (*c*) may be sown if the seeds of *Pueraria* are difficult to obtain or if it is considered that they are too expensive.

PRE-TREATMENT OF SEED TO PROMOTE GERMINATION

Seed of commercial quality does not normally give more than about 30 per cent germination where it is sown without any pre-treatment, and the germination is spread over a long period. The germination rate can be greatly accelerated by softening the seed coat, rendering it permeable to water which is necessary to start the process going. It may be done by acid treatment, which gives the best results but is unsuitable for normal estate practice, or by heat treatment. Both cause the seed to absorb water much faster than they otherwise would. With seed which without treatment will give 30 per cent germination in four weeks, hot water treatment will lead to about 50 per cent germination in one week, and acid treatment to over 80 per cent in three to four days.

Acid treatment — Seeds are placed in glass, porcelain or glazed earthenware vessels. Enough *concentrated* sulphuric acid is poured in to cover the seeds, which are stirred frequently with a glass or porcelain stirrer. After 15 minutes, as much acid as possible is poured off quickly. Water is added in small quantities with constant stirring to prevent dangerous spurting. *Concentrated sulphuric acid is extremely corrosive and dangerous to handle.* The seeds are washed several times in fresh quantities of water to remove all traces of the acid, and are left overnight in water to soak.

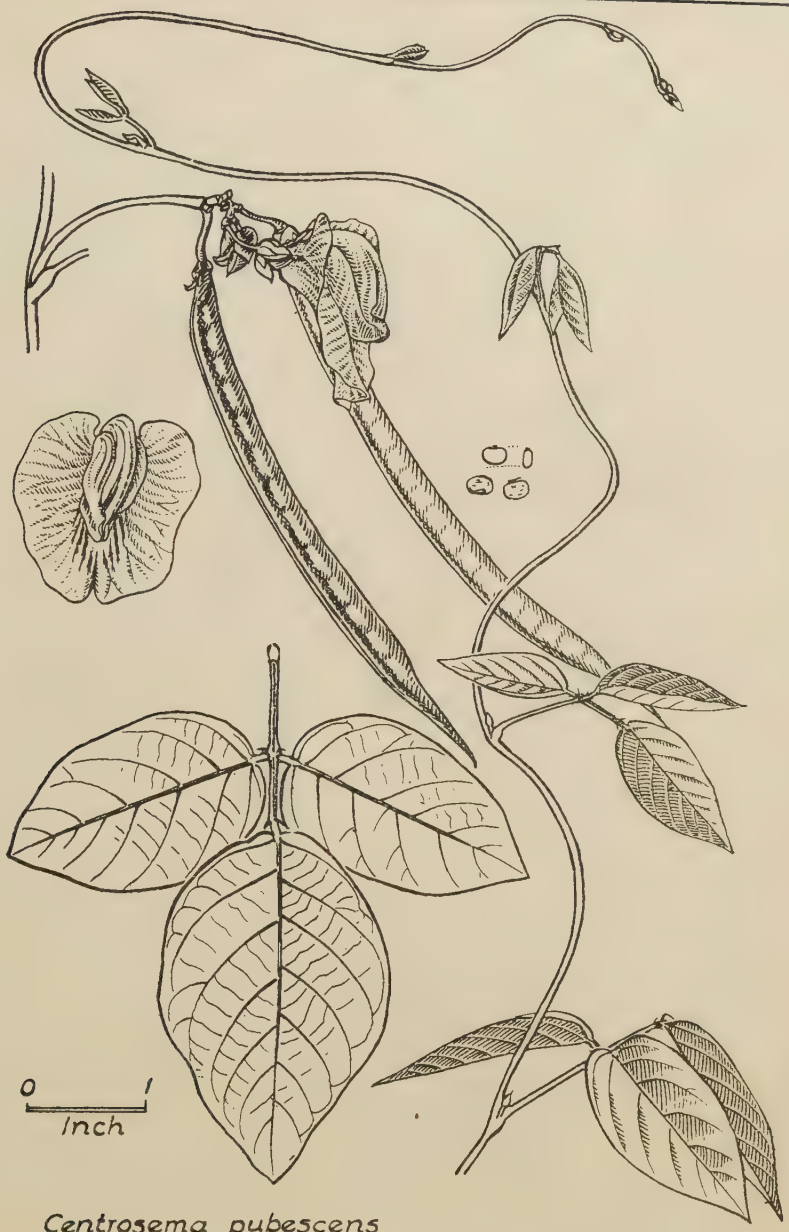
Hot water treatment — Of the two methods to be described, (*a*) is more suitable for small and (*b*) for large quantities of seed:

a Add just sufficient water heated to 75°Centigrade (or 165° Fahrenheit) to cover the seed. The water will cool in heating the seed, the temperature of which will rise to about 50°C only. Too much hot water must be avoided as it would overheat the seed and injure it. When cool an excess of cold water is added and the seed left to soak overnight.

b Fill a vessel, say a latex collecting bucket, three quarters full of seed and add water up to the brim. Keep the bucket covered to reduce evaporation, in a smoke house where the temperature is constant at about 50°Centigrade (or 120°Fahrenheit) overnight or until the seed has swelled up.

INOCULATION WITH ROOT NODULE BACTERIA

After being treated to promote germination the seed should be drained and inoculated with a culture of root nodule bacteria, which live in association with the roots and by their ability to fix atmospheric nitrogen serve to improve the growth of their host plant. The roots of most legumes bear nodules containing these bacteria. Since nitrogen is taken



Centrosema pubescens

up by the plant only when in the combined form the presence of the bacteria closely associated with legume cover crop roots adds to the supply available. This is particularly important where the plants are growing on poor soils. The rubber plants must benefit indirectly, if not directly, from improved soil conditions brought about by the cover growth.

Calopogonium mucunoides

Root nodule bacteria are species of *Rhizobium*, of which there are many strains; with any one legume some are more effective than others, some are totally ineffective. Being widely distributed in the soil they will sometimes induce nodulation of cover crop plants without special

Pueraria phaseoloides

measures being taken; but, to ensure nodulation with a good strain, seed should be inoculated before planting. An actively assimilating nodule has a pinkish colour due to the presence of a substance like

haemoglobin. The Pathological Division maintains cultures of root nodule bacteria of proved effectiveness on a range of leguminous cover plants, ready for subculturing and distribution when required. The bacteria are grown on a sterilised agar medium in tubes plugged with cotton wool, which should not be removed until the cultures are about to be used. For safe transit the tubes are packed in wooden boxes. One strain which has been widely distributed is effective on *Centrosema pubescens, Pueraria phaseoloides* and *Calopogonium mucunoides,* which can therefore be inoculated mixed together.

Cultures are best used fresh but they can be satisfactorily stored for several weeks if they are kept in a cool dark place. They should not, however, be refrigerated. Alternatively, if planting is to extend over many weeks, a series of small consignments will be supplied at intervals to suit the planting programme.

Procedure — To inoculate the seed a bacterial suspension is made. Ordinary water is satisfactory for the purpose, but in laboratory experiments with *Centrosema pubescens* better results were obtained when the bacteria were suspended in ordinary formic acid serum from the coagulating tank. One pint — sufficient to treat about 20 lb of seed — can be made up from one culture tube as follows:

> Remove the cotton wool plug and pour in the suspension medium (serum or water) until the tube is three parts full. With a clean glass rod or thin wooden skewer, rub the bacterial culture off the surface of the nutrient agar and mix it with the liquid. No harm is done if some of the agar comes away in the process. Stir the concentrated bacterial suspension into the bulk of the suspension medium, rinsing the tube once or twice into the main stock.

Place the seed in a suitable clean container and pour the appropriate amount of suspension over it, stirring to ensure that all the seed is thoroughly wetted. Afterwards spread it in a thin layer to dry superficially out of the sun, mix in the rock phosphate and plant out as soon as possible.

Cultures are supplied in multiples of five tubes, at a charge of $1 per tube to cover the cost of labour and materials. A refund of 50 cents is allowed on the return of empty tubes in the boxes in which they are packed. When ordering supplies a week should be allowed for the cultures to be prepared, and the following information given:

i the species of cover crop to be inoculated,
ii whether seed of different species is to be mixed,
iii the number of tubes required or the amount of seed to be treated (one tube for each 20 lb of seed),
iv when the cultures will be needed.

SOWING

Opinions differ regarding the amount of seed required per acre. An effective cover has been successfully established using only 3 lb but a more usual practice is to sow the seed mixture at the rate of about 5 lb per acre. If time is not important, and given the right conditions, there is no doubt that the ground can be covered effectively using only a small amount of seed per unit area but conditions in areas being prepared for planting or replanting are such that there is need for covering the exposed soil as quickly as possible and it is then better to err on

the generous side when considering the quantity of seed to be sown in the area. Normally, 5 lb per acre should be adequate.

Method of sowing — A procedure commonly followed is to dibble in the seeds in a single, lightly cultivated strip midway between the rubber rows, or in two or more parallel strips if the rows are widely spaced. Weeding on each side of the established strips of cover will be necessary from time to time until the legumes cover the ground completely.

Another method of establishment which is sometimes favoured is to plant the seeds in roughly circular cultivated patches spaced about 4 to 5 feet apart in the space between the rubber rows, but not closer than about 6 feet from the rubber plants. A complete cover may be achieved in a shorter time by this method but it probably entails more careful supervision of weeding in the early stages. If during this initial period the weeds are eradicated by spraying with weedkillers, it is probably easier, from a practical point of view, to spray on both sides of regularly spaced strips than it is to spray between irregularly spaced patches of the legume cover.

MANURING

For the purpose of establishing a leguminous cover in most areas being prepared for planting or replanting phosphate is the only nutrient element that needs to be added to the soil in the form of fertiliser. The initial requirement will be satisfied if the cover crop seeds are mixed with an equal weight of Christmas Island rock phosphate before planting. This ensures that a small amount of phosphate is added at the point where the seeds are placed. At about 2 months after planting, rock phosphate should be sprinkled over the surface of the ground in the patches or strips where the cover crop seeds have germinated. At this stage an application at the rate of $\frac{1}{2}$ cwt per acre should be adequate. A similar dressing may be given about 3 months later, again restricting the application to the patches or strips where the cover crop is established.

About nine months after sowing the seed — when the cover crop should have spread quite considerably — another dressing of rock phosphate should be given at the rate of 1 cwt per acre, but this time it should be broadcast over the whole space between planting rows. Provision should be made for a similar application in subsequent years at intervals of about 12 months, so long as the cover crop lasts.

As stated above creeping legumes normally respond well to treatment with phosphate and addition of other plant nutrients is not often necessary. But there will be exceptions and it sometimes happens that the creeper fails to grow vigorously in relatively small isolated patches because some essential nutrient other than phosphate is deficient. An application of smokehouse ash is then often beneficial. Its chief value is as a source of potash but it also contains traces of other essential nutrient elements. But smokehouse ash is of little use unless it has been stored under cover, for the rain soon washes out most of the effective nutrients. Furthermore, the use of fresh smokehouse ash should be avoided; it is safer to use material that has been stored under cover for some time. Fresh ash broadcast over the cover may cause severe scorching of the leaves. It is advisable to avoid manuring with smokehouse

ash when leaves of the cover are wet; as an added precaution it might be advisable to shake the aerial parts of the cover after the ash is broadcast to ensure that most of it falls on the ground below. It is expected that the need for adding wood ash will occur only in relatively small patches so the suggested procedure is not as unpracticable as it may seem.

Some soils may be deficient in magnesium. If the rubber plants show symptoms of magnesium deficiency the chances are that the leguminous creeper in the same area will also benefit from an application of magnesium limestone. We would then advise application at the rate of 1 cwt per acre over a small section of the area in the first place. If the cover crop shows any signs of improvement after 3 or 4 months, magnesium limestone may than be broadcast over the whole area.

WEEDING

For successful establishment of leguminous creepers some control of certain existing indigenous growths is generally necessary. Lalang, of course, should be completely eradicated whenever it appears, and the smaller grasses should also be regarded as strong competitors which may prevent the legume creeper from spreading, especially in the early stages. During this initial period it may be necessary to remove grasses in narrow strips or bands in close proximity to the legume, while in the remainder of the area the grasses can be controlled by careful spraying with a one per cent solution of sodium arsenite, or with oils. Later on, when the legume creeper begins to grow vigorously, little hand weeding should be necessary and the grasses can be controlled by spraying ahead of the spreading creeper.

Upright indigenous growths should not be eradicated as they do not prevent the spreading of leguminous creepers, and they help by providing a structure upon which the creeper can climb before it forms a complete cover.

Reprints are still available, on request, of the article 'Inoculation of Cover Crop Seed'. This appeared on page 47 of Planters' Bulletin 5, but the information contained has been included in the comprehensive article above, for convenience.

R. R. I. News

Details of a new bale marking paint, as recommended by the R.R.I., may be obtained on request.

o

In comparing nitrate and ammonium feeding of nitrogen to young rubber plants grown in pots, it was found that plants grew satisfactorily when fed with ammonium nitrogen only, and that their tissues contained nitrate. High applications of nitrogen in the ammonium form induced magnesium deficiency in these experiments.

o

Emulsion A Concentrate, used in bleaching crepe (*Planters' Bulletin 10*, page 7) is no longer available through the original supplier in Malaya. The agency is now held by Messrs Jacobson Van Den Berg (Singapore) Ltd.

Ustulina Root Rot

IF ABUNDANCE WERE TO BE THE CRITERION of importance for root disease fungi then *Ustulina* would certainly not be grouped as a minor root disease together with *Sphaerostilbe* and *Poria*, but would come before the major diseases — red, brown and white. However, it is the harm they do that determines their degree of importance. The fungus *Ustulina zonata*, though a ubiquitous saprophyte of dead wood in rubber plantations, is not commonly found to have infected undamaged trees. It is rarely found attacking trees in newly established plantations, in contrast with the major diseases.

Ustulina is primarily a wound parasite, most familiar as a cause of collar rot. Because it is sometimes associated with the presence of pads of earth scrap at the base of the stem, a belief has arisen that collar infection is brought about in this way. There is no clear evidence to support the view. The infection may have started through mechanical wounds, such as those made during weeding operations, root disease control, or in the construction of drains, silt pits and isolation trenches.

Collar rot may also result from invasion through a lateral root infected by contact, just as with the major root diseases. It then represents an advanced stage of the attack, comparable with the collar rot that can arise with untreated *Fomes noxius*. *Ustulina* does not form rhizomorphs nor spread through the soil by growing over organic fragments, as has been demonstrated for *Fomes lignosus*. A diseased root may infect an undamaged one when the contact between them is intimate. A number of trees have been seen to have become infected by contact with one old jungle stump. In an unpublished set of observations by the late Mr R.P.N. Napper the progress of root infections from a jungle stump felled ten years previously was followed at intervals of four months. After three years, when the war put an end to the observations, the disease had penetrated in several cases beyond the laterals right into the collar of the tree.

Figure 1. Section of infected root, showing dark lines in the wood.

Ustulina root rot is frequently referred to as dry root rot, a name given to bring out the contrast with wet root rot caused by *Ganoderma pseudoferreum*. These terms are better not used as the wetness or dryness of the rot depends so much on the moisture content of the soil. Wood rotted by *Ustulina* is light brown and readily fragmented, with a network of irregular black lines running through it (*Figure 1*). On its surface, under the bark, grey white sheets of mycelium may be seen.

Figure 2. Section through an infected collar, showing the extension of the fungus above and below the point of entry. The dark area in the centre is a cavity.

The development of a collar rot is a slow process. *Figure 2* shows a collar infection which arose from a root contact. The fungus had extended well above and below ground level, but the wood was still hard. As the rot progresses the wood becomes a brittle mass which weathers away to leave a cavity at the base of the tree. It takes many years and can long remain unnoticed. *Ustulina* is sometimes the unsuspected cause of the drying up of a low cut on an apparently healthy tree. It rarely kills trees outright, but so weakens them that they blow over.

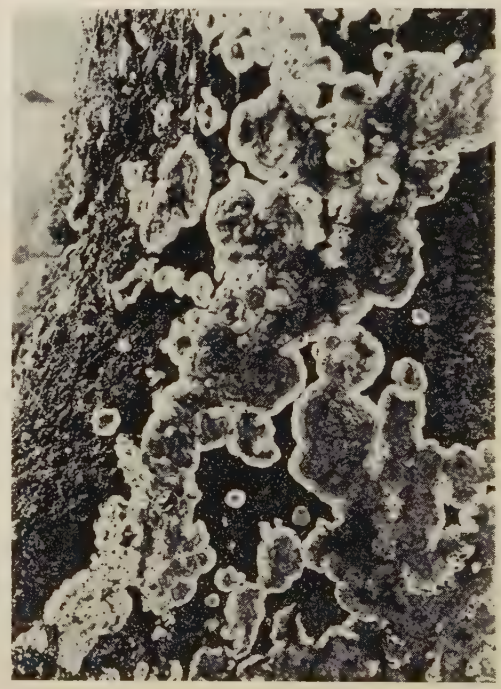


Figure 3. Old fructification showing zoning; dark centre — the charcoal stage; white margins — the velvety stage.

The fructification, instead of being a brightly coloured bracket, is a flat grey black structure an inch or two across, attached to the bark only at its point of origin. Fusion of many together gives rise to large irregular patches measuring as much as two square feet (*Figure 3*). As a fructification enlarges it forms growth lines which give the characteristic zones from which the specific name is derived. Usually preceding the dark

charcoal like fructification is a velvety stage of light grey colour that produces spores all over its surface, in contrast with the internal sporing of the later stage. If a period of dry weather has stopped growth, rains may encourage development of the velvety stage on the surface of an old fructification. The spores, which may be blown in the wind or carried by insects, play a much more important part in spreading the disease than those of *Fomes* species.

Without fructifications there is a danger of confusing *Ustulina zonata* with *Fomes noxius*, though roots infected with *Ustulina* do not have the brown skin of *F. noxius* with soil adhering. With both, the rotted wood contains dark lines, but they can be distinguished in that the lines of *Ustulina* are black and do not penetrate far into the interior, whereas those of *F. noxius* are brown and extend throughout the invaded wood. Sometimes they occur together on the same tree.

Treatment — To treat *Ustulina* it is necessary to cut away all infected bark and wood. In an advanced case a large part of the collar has to be removed, and unless the hole is filled with cement the tree is likely to be blow over. A tree not worth this amount of trouble should be felled and the diseased part burned. A measure that has been recommended if more thorough treatment is not feasible is to remove any fructifications that appear. This will not help the affected tree but will keep down the number of spores in the air. A further measure to prevent infection is to apply a dressing when a root is severed or a large wound arises in any other way.

PATHOLOGICAL DIVISION

Skim Rubber— A Warning and a Request

AT ONE TIME RUBBER PREPARED FROM SKIM LATEX represented a very small proportion of the dry rubber output of Malaya, but with the increase in concentrated latex production during recent years much larger quantities of rubber recovered from skim are now being marketed. Compared with the rubber found in the usual market grades, skim rubber has abnormal properties. The centrifuging process brings about concentration of non-rubber constituents — such as fatty acids, proteins, sugars and inorganic salts—in the skim fraction of the latex, so that when the latter is converted into a dry product relatively large amounts of non-rubber materials are present; these may be as high as 20% by weight, compared with about 6% for normal trade grades.

Apart from this substantial reduction in the amount of actual rubber in the final crepe or sheet, the increased quantities of non-rubber substances have a marked influence on the vulcanising properties of the rubber; they can cause vulcanisation to take place at six times the normal rate. It is both difficult and expensive to adjust factory processes to deal with such 'rubber', and a large increase in the number of rejects often results from the presence of such abnormal material in the compound. In addition, the fact that skim rubbers contain only about 80%

of rubber hydrocarbon instead of about 94% is sufficient to throw delicately balanced compounding formulae out of gear, thus causing dislocation in factory procedure.

Recently, it has been found by the Rubber Research Institute of Malaya that many commercial samples of skim crepe and sheet rubber contain appreciable amounts of copper: up to 20 parts per million, which is greatly in excess of the permitted maximum of 8 p.p.m. for copper in trade grades (Rubber Manufacturers Association Inc, New York, Specification). The amount found is dependent on factors such as the efficiency of centrifuging, the source of latex (some latices contain more copper than others), and seasonal changes. The presence of large amounts of copper in rubber may result in rapid deterioration of articles made from it, with serious consequences to the reputation of the manufacturer.

On the first page of the R.M.A. New York green booklet entitled 'Type Descriptions and Packing Specifications for Natural Rubber' the following warning is printed in heavy type:

> Skim latex coagula shall not be used in whole or in part for producing any of the RMA types.
>
> Copper and manganese content in any RMA type and grade of rubber shall not exceed the following maximum tolerances: Copper 8 parts and Manganese 10 parts per million.

Precisely the same ban on the use of skim latex coagula and the same tolerances for copper and manganese in the Singapore Types are contained in the blue book entitled 'Singapore Type Descriptions' issued by the Singapore Chamber of Commerce Rubber Association and endorsed by the Rubber Trade Association of Singapore and by the Federation of Rubber Trade Associations of the Federation of Malaya.

In view of the properties of skim rubber, it will be appreciated that manufacturers regard as vital the protection given by the above clauses. Many manufacturers can work off a small percentage of skim rubber with their normal feedstock, provided they know what they are handling. The special care and expense involved in doing this is reflected in the low prices which skim rubbers command.

A serious aspect of the problem is the fact that skim crepe can be produced which in appearance is similar to estate thin browns or other grades; it can also be worked off with scrap for producing compo crepes. Confusion may thus occur, and a packer may unwittingly consign skim in regular RMA grades. The manufacturer can detect the *non bona fide* tender even if only a few sheets of skim rubber per bale are included; this will naturally result in claims and loss of reputation of the shipper and of Malayan rubber generally.

It is reiterated that the use of skim latex in the present universally recognised Types constitutes *non bona fide* tenders, and we strongly advise that all rubber produced from skim be worked up as separate lots, and that the greatest care be taken both to label the rubber with the word SKIM and to indicate clearly on all documents the fact that it is SKIM rubber. All producers of the material should recognise their responsibility in this matter and should take steps to ensure, as far as possible, that the rubber is finally shipped as SKIM.

Skim Rubber—A Warning and a Request

The R.R.I. would like to draw attention to two points:

1 A simple test is being developed which permits the identification of SKIM rubber. Small pieces, the size of a rice grain, are dropped into a special liquid; normal rubber floats, SKIM sinks. Details of the method will be supplied by the R.R.I. on request.

2 A new process for preparing rubber from skim latex is being developed; it has reached the stage of pilot plant trials and details will shortly be available for release to those interested. The product will still be SKIM rubber, but will have markedly improved properties and should command a higher price. Manufacturer's evaluation is being sought and it is hoped to market the material as a special rubber.

CHEMICAL DIVISION

Our attention has been drawn to British Patent 695,813 which describes a process for preparing an improved quality rubber from centrifuged latex skim using a proteolytic enzyme such as trypsin.

Basket Planting

Basket planting is usually employed with valuable clonal seed or for establishing late (off-season) supplies to an area planted with seed at stake.

The size of the basket depends on requirements; if seedlings are to be kept in them for long, large ones are essential. The usual size is about 4 inches across at the top and 9 inches long. This size is suitable for growing plants until the first pair of leaves has hardened. It is usual to fill each basket with good topsoil, adding $\frac{1}{8}$ ounce (a level teaspoonful) of rock phosphate to the soil in the top half.

Germination of the seed may be carried out as usual in a shaded bed. One seed in the early stages of germination is put into each basket, in a horizontal position with the rounded side uppermost, and is just covered with earth. If the radicle has extended it is advisable to make a hole with a finger or small stick for it.

Basket plants are usually kept in a bed shaded with atap or palm leaves for about two weeks, when they should have made 12 to 18 inches of growth and the first pair of leaves be fully expanded. The shade may then be removed gradually to harden off the plants. They will then be ready for the field.

Drying of the soil in the baskets while they are in the nursery may be avoided by placing the baskets upright in a narrow trench and filling the spaces between them with sand or soil. The site of the nursery should be protected from cattle, goats, pigs, *etc* and if the seed is valuable from rats as well. If snails are common, poison bait should be put down.

Planting out is best done in rainy weather and into prepared holes so that the soil in the basket is level with the ground. It may be advisable to remove the bottom of the basket when it arrives at the planting point, to

minimise the possibility of twisted tap-roots. In lifting older basket plants from the nursery care must be taken not to cause unnecessary damage to those which may have grown their taproot through the basket bottom into the ground beneath. A sharp knife should be passed under any basket which is felt to be anchored.

Covers and Root Disease

Recent evidence shows that a heavy incidence of white root disease, *Fomes lignosus,* can arise in a replanting where *Pueraria* has been allowed to form a dense mat of growth right up to the young trees. Infection takes place at the collar by contact with diseased roots of the cover crop. *F. lignosus* will spread also on the roots of many other covers. Creeping covers should therefore be kept away from the trees by periodic ring or strip weeding in areas where white root disease is widespread.

Black Masterbatches

Preparation of carbon black latex masterbatches in the producing countries would make for cleaner handling at the consuming end. A messy operation is avoided by incorporating the carbon black under wet conditions.

Masterbatches with good mechanical properties and high Mooney viscosity have been prepared, but after shipping the properties changed for the worse.

The Institut Francais du Caoutchouc, Paris, and the Institut de Recherches sur le Caoutchouc en Indochine, Saigon, found that the trouble is high rate of oxidation. They have studied, and exonerated, a number of factors which might have led to this condition. It now appears that pre-treatment of the carbon black might help to reduce the oxidation, but this may not prove to be practicable under commercial conditions.

Low Temperature Rubbers

Recent progress demonstrates how natural rubber can 'hit back' at synthetics in special fields of use. High flying aircraft, and the opening up of the Arctic regions, have created a demand for rubbers which retain their properties at very low temperatures – eighty degrees of frost or more. Natural rubber behaved better than earlier types of GR-S, but the development of an 'arctic GR-S' reversed the advantage.

Our sister organisation in England, the British Rubber Producers' Research Association, has now achieved a natural rubber compound better for the purpose than any synthetic yet produced, on grounds of cost as well as low temperature performance. Certain of the silicone rubbers are of use at such low temperatures, but their physical properties are poor and they cost about six times as much.

R. R. I. News

A large scale trial of clones RRIM 619 – 630 on the R.R.I. Experiment Stations has shown, under the conditions of the trial, RRIM 621 and 623 to be the most vigorous and RRIM 629 the least.

A New Binding Case for Planters' Bulletin

The initial stock of special binding cases for *Planters' Bulletin* is exhausted, but a new and improved binder is now available at $5, post free in Malaya. The opportunity has been taken to embellish the spine with the new colophon, based on a wood engraving by Reynolds Stone.

A dozen issues can readily be inserted one by one, as they arrive. Each issue is held by an inconspicuous wire and will open flat for ease of reference.

Price $5 post free in Malaya
Please remit with order

Supply of Budwood

The supply of budwood of RRIM '600' series clones is now exhausted, and no further orders can be accepted before April 1955.

OUR COVER SHOWS TWO DIFFERENT LATEX CENTRIFUGES WORKING AT THE R.R.I. EXPERIMENT STATION
Photograph, Dr P.R. Wycherley

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